

endosperm. Other fungi like *P. grisea*, *F. moniliforme* were detected from all parts of seed viz., seed coat, endosperm and embryo.

Seed treatment with carbendazim @ 0.2 per cent was most effective in reducing the per cent infection (5.33%) and recorded higher seed germination (91.33%) and vigour index (2746.00). The leaf extract of *Azadirachta indica* @ 20 per cent significantly reduced the per cent infection

(6.25%), recorded higher germination (86%) and seedling vigour (2596.9). *Pseudomonas fluorescens* was found to reduce per cent infection (8.5%) recorded higher germination (87%) and seedling vigour (2468.80).

Among fungicides and neem based products evaluated in the field, carbendazim @ 0.1 per cent was found to be effective in reducing grain discoloration, increasing grain yield and also thousand grain weight.

Studies on Seed-Borne Fungi of Wheat in Parts of Northern Karnataka

G.MANJUNATHA

2001 MAJOR ADVISOR: Dr. M. S. LAXMINARAYANA RAO

Studies on seed-borne fungi of wheat in parts of northern Karnataka was conducted during 1999-2001 at Department of Plant pathology, College of Agriculture Dharwad. Seed health testing, transmission of seed-borne fungal pathogens, effectiveness of seed treatments with fungicides, botanicals and bio-agents, probable improvement of seed treatment efficiency using organic solvents for priming and compatibility of bio-agents with seed treatment fungicides were studied.

Nineteen varieties of wheat seed samples collected from different areas of northern Karnataka, showed varied type of seed-borne infection ranging from 6-80 per cent in standard blotter method. The fungal species viz., *Alternaria alternata*, *Exserohilum hawaiiensis*, *Fusarium moniliforme*, *Rhizopus stolonifer*, *Curvularia lunata*, *Aspergillus flavus*, *Aspergillus niger*, *Chaetomium globosum* and *Penicillium citrinum* were noticed on seed. Among the different seed health testing methods, standard blotter

method was found to be efficient which revealed higher counts of infection. Transmission study revealed that *Alternaria alternata* and *Exserohilum hawaiiensis*, transmitted from seed to plant systemically. Higher infection of fungi reduced seed germination and vigour index significantly.

Seed dressing fungicides viz., captan, carboxin, bioagent *Pseudomonas fluorescens* and botanicals *Azadirachta indica* and *Ocimum sanctum* treatments were most effective in minimizing seed-borne infection with unproved seed quality parameters like germination and vigour index. PEG at 40 per cent was most suitable organic solvent as printing agent for wheat seed treatment.

Carboxin was found to be compatible with bioagents *Trichoderma viride* and *Trichoderma harzianum* at the concentration of 100, 200 and 400ppm followed by captan at 100 ppm.

Management of Root-Knot Disease (*Meloidogyne incognita* (Kofoid and White) Chitwood) of Bittergourd (*Momordica charantia* L.)

LAXMAN A. PADANAD

2001

MAJOR ADVISOR: Dr. S. LINGARAJU

A random survey for the incidence of bittergourd root-knot disease in parts of northern Karnataka revealed that a higher disease incidence was noticed in parts of Belgaum district and there was no disease incidence in Dharwad district.

On the basis of perineal pattern, prevailing root-knot nematode infecting bittergourd was identified as *Meloidogyne incognita*. It took 21 days to complete one life cycle under Dharwad conditions.

Two fungi *Phialomyces* sp. and *Aspergillus nidulans* isolated from bittergourd rhizosphere in experimental site in cultivator's field at Yamakanamaradi,

Belgaum district were tested for their antagonistic effect. The culture filtrates of these two fungi at different concentrations of 2.5, 5, 10 and 50 per cent were tested on known number of nematodes. *Phialomyces* sp. recorded a higher mortality percentage of 92.98, 72 hours after inoculation at 50 per cent concentration. Whereas, *Aspergillus nidulans* recorded 72.86 per cent after a similar period. In general, as the concentration of fungal culture filtrate and period of exposure increased, the mortality of the juveniles also increased.

Among different cultivars evaluated for their reaction to *M. incognita* at different inoculation levels of 0,

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250, 500, 1000 and 1500 juveniles/root system, only two cultivars Green Long and White Long were found moderately resistant upto 500 J2 of *M. incognita* because these cultivars recorded less number of galls per root system. Others exhibited susceptible reaction.

In a field management trials, soil application of carbofuran at 1 kg a.i./ha, phorate at 1 kg a.i./ha at sowing and marigold as intercrop produced maximum leaves/plant, fruit length, fruit girth, vine length and yield. They also recorded less number of galls per root system and number of juveniles at harvest.

Physiological and Biochemical Factors of Resistance to Leaf Rust of Soybean caused by *Phakopsora pachyrhiz* Syd.

B.G. MAHESH

2001

MAJOR ADVISOR: Dr. P.V. PATIL

A pot experiment was conducted using three moderately resistant genotypes viz., PK1024, PK1029 and Ankur and two susceptible genotypes viz., JS 335 and DSbl to know the physiological and biochemical factors of resistance to leaf rust caused by *Phakopsora pachyrhiz* Syd.

The histological studies indicated that, the resistant genotypes had thicker leaf lamina, epidermis and more number of epidermal cells per millimeter.

The physiological studies revealed that the number of stomata were more among susceptible genotypes than resistant ones. The lower surface of the leaves had more stomatal number than upper surface. Stomatal length breadth and aperture length were more among resistant genotypes than susceptible genotypes. The wax content was higher in Ankur (0.45 $\mu\text{g MM}^{-2}$).

The biochemical studies indicated that at 45 days after sowing (DAS) the diseased leaves of resistant

genotype, PK1024 had higher phenol content (0.504 mg g freshwt⁻¹) than healthy leaves (0.501 mg g freshwt⁻¹). At 75 DAS, the healthy leaves of PK1029 had higher phenols (1.20 mg g freshwt⁻¹) than under diseased conditions where leaves of PK1024 had higher phenols (1.33 mg g freshwt⁻¹). Total sugars were higher in healthy leaves of Ankur at both 45 and 75 DAS (5.20 and 7.60 mg g freshwt⁻¹) than diseased leaves. Soluble proteins were higher in healthy leaves of JS 335 (45.71 mg g freshwt⁻¹) at 45 DAS as compared to diseased leaves. At 75 DAS healthy leaves of PK1024 recorded higher protein content of 50.6 mg g freshwt⁻¹ than diseased leaves. Total chlorophyll content was higher in healthy leaves of PK1024 at both 45 and 75 DAS (1.47 and 2.23 mg g freshwt⁻¹) than diseased leaves. All the biochemical components were found higher in top leaves than the bottom leaves. Peroxidase and polyphenol oxidase bands were monomorphic in the initial stages but at later stages they were found polymorphic indicating their role in rust resistance.

Studies on Okra (Bhendi) Yellow Vein Mosaic Virus

ZULFEQUAR AHMED

2001

MAJOR ADVISOR : Dr. M. S. PATIL

Okra (Bhendi) is one of the important vegetable crops grown extensively throughout the tropical, subtropical and warm regions of the temperate zones of the world. Bhendi suffers from several diseases with substantial losses in yield. Of all the diseases, BYVM is one of the most of severe disease which takes a heavy toll in India.

The survey was conducted to know the distribution of BYVMV in Northern parts of Karnataka during kharif 2000 and summer 2001 in the bhendi growing areas of Belgaum, Dharwad, Gadag and Haveri districts. During kharif season, the incidence varied from 0.0 per cent to 18.5 per cent (Hukkeri). Whereas, the incidence was markedly higher in summer months which ranged from 12.6 per cent (Kubihal) to 78.6 per cent (Dhundshi).

The infected plants were characterised by production of yellow vein mosaic symptoms, vein clearing, slight curling and reduction in the leaf size. The virus was not transmissible by sap inoculation, seed or dodder, but it was transmissible by whitefly *Bemisia tabaci* and by graft transmission.

The virus has narrow host range and produced symptoms like crinkling, curling, and vein clearing on *Croton bonplandianum* and *Althaea rosea* 20-35 day after inoculation. Histopathology studies of BYVMV infected leaves showed that palisade tissues start losing their columnar appearance with the intercellular spaces in leaf tissue and there was reduction in number of epidermal cells in fruit rind as compared to healthy ones.

Among the different insecticides, viricides and plant extracts tested soil application of carbofuran 3G (15 kg/ha) + metasystox (0.2%) or rogor (0.2%) reduced vector population and also disease incidence.

Among 19 genotypes screened against BYVMV

none of the genotypes were found to be immune. Arka Anamika, Hybrid No. 8 and 10 genotypes showed resistant reaction. Soumya F₁ (OH-4002) and Reshma were moderately resistant, most of the genotypes (13) showed susceptible reaction and Pusa Sawani genotype was highly susceptible to yellow vein mosaic disease.

Studies on *Colletotrichum gloeosporioides* (PENZ.) Penz and Sacc. The Causal Agent of Leaf Spot of Cashew (*Anacardium occidentale* L.)

K. DEVARAJU

2001

MAJOR ADVISOR: Dr. K.S. NAIK

Studies on *Colletotrichum gloeosporioides* a causal agent of leaf spot of cashew (*Anacardium occidentale* L.) Includes survey of the disease spread, morphological, physiological, nutritional studies, spore germination, toxin studies, host range studies and *in vitro* evaluation of chemicals and botanicals.

During survey in three districts the maximum mean per cent disease index was found to be 17.10 in Sirsi. The fungus was isolated from infected cashew leaves. The pathogenicity was proved by spraying monoconidial culture which resulted in the formation of numerous oval or irregular brown or deep brown spots of variable sizes and shapes were noticed. The conidia were cylindrical or oblong, hyaline single celled with oil globules in the centre and measured about 8.2 to 10.34 x 3.4 x 4.5 μ m. Spores germinated with varied number of germ tubes originated from any surface of the conidia. Among various media tested

maximum spore germination occurred in two per cent sucrose solution. Potato dextrose agar and Richards's broth were best solid and liquid media respectively which supported maximum growth of the fungus. Sucrose, potassium nitrate and magnesium sulphate yielded maximum dry mycelial weight of the pathogen among the carbon, nitrogen and sulphur sources respectively. Maximum growth of fungus was recorded at 6.5 pfi and 30°C temperature. Maximum toxic metabolite was produced when sucrose, potassium nitrate and magnesium sulphate were used as carbon, nitrogen and sulphur sources, respectively. The pathogen showed positive reaction on all the host tested. *In vitro* evaluation of fungicides and botanicals revealed that carbendazim (500, 1000 and 1500 ppm) and garlic bulb extract (5 and 10%) were effective against *C. gloeosporioides* respectively. Among different cultivars tested, Venguria-1 showed resistant reaction for leaf spot of cashew under artificial condition.

Ecology and Management of Fusarium Wilt of Chili

H.M. MADHUKAR

2001

MAJOR ADVISOR: Dr. M.K. NAIK

Chilli (*Capsicum annum* L.) is an important commercial crop of India and Fusarium wilt has become a serious problem in recent years causing huge losses. Hence, the present investigation included survey and ecology evaluation of genotypes, Fungitoxicants and bioagents for managing Fusarium wilt of chilli.

Severity of wilt was more in Raichur district followed by Bellary and Dharwad. Affected plants showed loss of turgidity in leaves, interveinal clearing and slight chlorosis before wilting. Wilted plants showed brown vascular discoloration. Macroconidia of the fungus measured 29.70 - 47.85 x 4.95 - 6.6 μ and microconidia were 6.6-19.8 μ x 3.3 - 6.6 μ and chlamydospores were 8.25 - 11.55 x 6.6 - 9.9 μ . The pathogen was identified as *Fusarium solani* (Mart.) Sacc. And is deposited at IARI, New Delhi (ITTC No. 5219). The fungus grew well after 20

days of incubation with maximum growth at a temperature of 25°C with preference for neutral pH.

Genotypes were screened using sick soil, rapid root-dip transplanting and seed inoculation techniques. Among the 30 Genotypes, none of them was found to be immune and only genotype IHR 3018 was found resistant. DS-1 and LCA-206 were moderately resistant. Among fungicides evaluated through different techniques captan among non-systemic fungicides and bavistin, benlate and topsin-M among systemic fungicides were very effective in inhibiting the growth of *F. solani*.

Seven potential bioagents were evaluated under laboratory as well as soil condition. *T. Viride* S-PDBCH-10 with 100 per cent inhibition followed by *T. harzianum* PDBCH-10 (82.9 %) inhibition and *Trichoderma* sp.

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(Indigenous) were effective in inhibition. Under soil condition *Fusarium* population was reduced to zero by *harzianum* PDBCH-10 followed by *Trichoderma* sp. The resistant

source, the effective fungicides and the efficient bioagent identified would give option for integration for successful management of *Fusarium* wilt of chilli.

Studies on Epidemiology and Management of Sesame Leaf blight Caused by *Alternaria sesami* (Kawamura) Mohanty and Behera

M. R. SRINIVASA REDDY

2001

MAJOR ADVISOR: Dr. Y.D.NARAYANA

Leaf blight of sesame (*Sesamum indicum*), caused by *Alternaria sesami* is an important disease and is a major constraint in sesame production.

Pathogenicity test revealed that, the affected leaf blight symptoms appeared as minute brown spots which turned later darker in colour with circular to irregular in shape having concentric rings. The leaf spot later stages coalesced to form large irregular spots and in severe cases affected leaves dried and dropped off.

The disease severity increased with increase in rainfall and it was found that positive correlation was seen between per cent diseases index and cumulative rainfall.

Of the 12 dates of sowing tested, plants sown on 3rd week of July were found highly susceptible to disease. Conidial germination and germ tube length increased with decrease in the conidial concentration on both susceptible and resistant cultivars of sesame.

In-vitro evaluation of fungicides, among systemic fungicides it was found that triadimefon and thiophanate methyl at 0.1 per cent concentrations were found effective in inhibiting mycelial growth and conidial germination. Among non-systemic fungicides iprodione, mancozeb and chlorothalonil at 0.3 per cent were found effective in inhibiting the mycelial growth and conidial germination.

Triadimefon (0.1%) among systemic fungicides and iprodione, mancozeb and chlorothalonil (0.2%) among non-systemic fungicides were found effective in reducing disease index under *in-vitro* conditions. Use of iprodione increased the yield up to 144 per cent over untreated control. Among 104 sesame genotypes evaluated none of the genotypes found to be immune to leaf blight of sesame, however, four wild species viz., *Sesamum prostratum*, *Sesamum radiatum*, *Sesamum malabaricum* and *Maliabad* genotype showed resistant reaction.

Studies on *Colletotrichum capsici* (Syd.) Butler and Bisby Causing Leaf Spot of Turmeric (*Curcuma longa* L.)

B.S. CHIDANANDA SWAMY

2001

MAJOR ADVISOR: Dr. SRIKANT KULKARNI

Turmeric leaf spot caused by *C. capsici* is causing considerable damage to the turmeric plant and is becoming a serious disease, which is present in almost all turmeric growing areas of Belgaum, Bagalkot, Uttar Kannada districts.

Studies on *C. capsici* (Syd.) Butler and Bisby, A causal agent of leafspot of turmeric (*Curcuma longa* L.) includes survey for disease spread and intensity, morphological, cultural, physiological, nutritional studies, spore germination studies, susceptible stage of the host to infection, *in vitro* evaluation of genotypes for resistance and *in vitro* evaluation of fungicides, plant extracts and bio-control agents.

During survey in five districts, the average per cent incidence was found to be 15.68. Plants were most susceptible from 150 days onwards indicating the most vulnerable period. The conidia are single celled, sickle

shape, hyaline with oil globules inside the cell measuring 14.10- 21.62 x 2.40-3.89 μ m. The fungus revealed maximum growth on 12th Day of incubation in potato dextrose broth. Richards's medium supported

Maximum growth and the temperature of 30°C and pH 6.5 were found to be best for the fungal growth. Glucose and potassium nitrate were found to be best carbon and nitrogen sources for the growth of the fungus respectively.

A relative humidity of 100 per cent, a pH of 6.0 and a temperature of 30 °C were found to be most favourable factors for maximum spore germination. The presence and effect of toxic metabolites in the culture filtrate of the fungus was observed through wilting of tomato cuttings. Screening of genotypes indicated that, none of the cultivars showed immune reaction to the disease. However, cultivar viz., Rajapuri, showed resistant reaction. *In vitro* evaluation of

fungicides indicated that carbendazim and tricyclozole among systemic fungicides mancozeb and cuprous oxide among nonsystemic fungicides were effective. *In vitro*

evaluation of plant extracts and bio-control agents revealed that parthenium leaf extract and *Trichoderma harzianum* and *Pseudomonas fluorescens* were effective respectively.

AGRICULTURAL MICROBIOLOGY

Effects of Interaction Between Arbuscular mycorrhizae and Meloidogyne incognita on Tomato

LABEENA POOVANKAVIL

2001

MAJOR ADVISOR : Dr. M. N. SREENIVASA

An experiment was conducted at Agricultural College Dharwad during kharif season 2000 to study the interaction between five different AM fungi viz., *Glomus fasciculatum*, *Glomus macrocarpum*, *Gigaspora margarita*, *Acaulospora laevis* and *Sclerocystis dussii* and root-knot nematode *Meloidogyne incognita* on tomato.

Mycorrhizal spore count and per cent root colonisation were significantly highest in the plants inoculated with *G. fasciculatum* in both presence and absence of nematode. *Meloidogyne incognita* could not interfere with the sporulation and infection of AM fungi in dually inoculated plants. *Dehydrogenase* activity was also highest in presence of *G. fasciculatum*. In presence of nematode it did not differ significantly as compared to the non-nematodal plants. AM could reduce final nematode population and root knot index to a greater extent. *Glomus fasciculatum* was the best to reduce nematode multiplication and infection by *M. incognita*. Among five different AM fungi *G. fasciculatum* increased plant height maximum both in presence and absence of nematode. Plant height was minimum with the inoculation of *Meloidogyne incognita* alone. Inoculation of *G. fasciculatum* resulted in maximum biomass followed by *G. macrocarpum* and *G. margarita* as

compared to uninoculated control plants. AM could offset the damage caused by nematode and increased the plant dry biomass in dually inoculated plants. The AM fungi increased the phosphorus uptake by plants to a great extent. *Glomus fasciculatum* was best to increase uptake of P among the all five AM fungi followed by *G. macrocarpum* and *G. margarita*. In nematodal plants, mycorrhizal inoculation increased the uptake of P and thereby plant growth. Inoculation of *G. fasciculatum* had maximum effect in increasing the fruit weight per plant, diameter of the fruits and TSS among all the AM fungi tried. While these parameters were minimum in nematode infected non-mycorrhizal plants.

AM fungi differed in their effect in reducing the pathogenic effect of *M. incognita* in tomato. *Glomus fasciculatum* was found to be superior among all AM fungi in enhancing the plant growth and suppressing the nematode damage and thus making tomato plants resistant to root-knot nematode.

Allelopathic Effect of Selected Tree Species on the Soil Microflora and Their Activities

A.D.MOKASHI

2001

MAJOR ADVISOR: Dr. J. H. KULKARNI

Experiments to study the allelopathic effect on the rhizosphere microflora of greengram and wheat of the established bund planted *Eucalyptus*, *Casuarina* and teak were examined for a period of one year. The allelopathic effect was assessed from the tree rows from 1-18 m at an interval of 3m. A composite soil -sample, 30 m away from the bund planted tree rows served as a control. Soil sampling was done to study the microbial activity three times each under greengram during kharif and wheat during rabi seasons.

Microbial population under rhizosphere of greengram and wheat varied with increasing distance indicating the allelopathic effect of tree rows on the soil microflora. The nitrogen fixing casuarina tree row could

influence higher microbial activity nearer to the tree row, but the eucalyptus and teak showed the inhibitory effect on microbial activity. The nitrogen fixing ability of casuarina and the addition of organic residue through nitrogenous organic matter may be the reason for influencing the microbial load, symbiotic activities of *Rhizobium* and mycorrhizal fungi and also the enzymes. The phenols produced by eucalyptus and teak could have possibly suppressed microorganisms. Of the two inhibiting tree rows, eucalyptus was found to be more severe than the teak. Obviously, the eucalyptus is known to exude various phenolic substances and leaf litter that also add to soil high phenolics. Thus the allelochemicals produced by the trees are bound to influence not only the crop growth but also the microbial activity, underground.

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Effect of Single and Dual Inoculation of *Azospirillum* and Phosphate Solubilizing Bacteria on Sugarcane (*Saccharum officinarum* L.)

C.R. SHIVAKRISHNASWAMY

2001

MAJOR ADVISOR : Dr. J.H.KULKARNI

A field experiment was conducted at the research farms of Karnataka Institute of Applied Agriculture Research (KIAAR), Sameerwadi (Bagalkot dist. Karnataka) to study the effect of single and dual inoculation of *Azospirillum* (strains ACD 15 and ACD 20) and phosphate solubilizing bacteria (*Bacillus polymyxa* and *Burkholderia cepacia*) on microbial dynamics and their relation to soil enzymes in rhizosphere soil and also on growth, nutrient uptake, cane yield and other parameters of sugarcane Cv. CoC 671.

The results indicated an enhanced *Azospirillum* population both in rhizosphere as well as in endorhizosphere on inoculation with *Azospirillum* strains singly or in combination with P-solubilizing bacteria. Proliferation of rhizosphere population of P-solubilizing microorganisms was observed with their inoculations either singly or combined with *Azospirillum*. Of the soil enzymes studied only the dehydrogenase and not the urease and phosphatase was found to be influenced by the increased microbial population in rhizosphere soil.

In general observations on the nutrient uptake, crop growth and cane yield indicated a possibility of saving 75 per cent nitrogen and phosphorus. Soil nutrient status was marginally improved with the dual inoculations, resulting in increased nutrient uptake by the plants over uninoculated control. Significant positive influence of dual inoculations was evident with the plant height which further contributed to record a higher stem dry matter. Although the changes in leaf dry matter was not significant with the inoculations, total shoot dry matter was higher with the dual inoculations. Number of millable canes and the cane yield was highest due to dual inoculation of *Azospirillum* ACD 20 with *B.cepacia* and was 5.3 per cent superior to the uninoculated control receiving 100 per cent RDF. All other dual inoculations also recorded significantly higher cane yield. On the other hand sucrose and CCS per cent were superior due to dual inoculations and were more pronounced with the inoculation of *Azospirillum* ACD 15 with *B.cepacia*.

Analyses of PGPS Mutants of MPS Bacteria and Their Effect on Plant Growth and Nutrient Uptake

GEETA S. KADAPATTI

2001

MAJOR ADVISOR : Dr. A. R. ALAGAWADI

Investigations were carried out to study the effect of plant growth promoting substances produced by phosphate solubilizing bacteria by developing mutants with altered PGPS activity. A total of twenty-eight PSB strains were screened for MPS activity and PGPS production. The strains were found to release 10.51-38.08% Pi from TCP and produced 3.61-35.45 µg/25ml LAA and 1.33-13.27 µg/25ml GA. While fourteen strains belonged to *Pseudomonas*, eight to *Serratia*, two each to *Bacillus* and *Enterobacter*, and one each to *Xanthomonas* and *Erwinia*. Gluconic acid was produced by all the strains but many strains also produced citric, tartaric, malic, succinic and unidentified organic acids. Based on MPS activity and IAA and GA production, fifteen strains were selected to study plant growth promotional activity in pot culture. All the inoculated strains increased growth, biomass and nutrient uptake of tomato plants over RP control. Based on MPS activity,

IAA and GA production and plant growth promotional activity, five strains were selected for mutational studies through random mutagenesis using nitrosoguanidine. Thirty mutants with altered PGPS activity were obtained. Further, 16 of these mutants were examined for their influence on plant growth and nutrient uptake of tomato plants in pot culture with unsterile soil. The mutants with reduced ability to produce IAA/GA or GA- mutants failed to promote the growth and nutrient uptake of tomato plants whereas hyper producing mutants increased the growth as compared their wild type strains. A sand culture experiment was conducted to confirm the role of IAA and GA on plant growth promotion. The mutants showed almost similar trends in stimulating plant growth and nutrient uptake as observed in natural soil. From these experiments it was found that phytohormones contribute equally to the plant growth as that of P solubilization.

Nitrogen Fixation Efficiency in Soybean Under Different Levels of Nitrogen Application

B. DEVENDRA GOUD

2001

MAJOR ADVISOR : Dr. V.S. EMMIMATH

Soybean (*Glycine max* (L.) Merrill) is one of the oldest cultivated leguminous crops of the world but introduced in India during the middle of this century to meet the growing vegetable oil demand and it is grown extensively in North Karnataka.

In the present investigation the response of soybean to five azide resistant mutants of *Bradyrhizobium japonicum* (RDB 104, RDB 201, USDA 24 M₁, RLB 204 and RLB 203) with one standard strain SB 120 at three levels of nitrogen (20, 30 and 40 kg N/ha), urea was studied to evaluate the suitability of rhizobial strain in laboratory and field conditions. These strains were collected from the Department of Agricultural Microbiology, UAS, Dharwad. These strains specific to soybean were characterized by morphological, cultural and biochemical characteristics.

The experiment was conducted at Main Research Station, UAS, Dharwad. The inoculation of USDA 24 M₁ recorded maximum number of root hair curhngs, shoot and root biomass, nitrogen content in plant parts at different growth stages. Highest nitrogen content in soil after harvest and grain yield were also recorded with USDA 24 M₁.

Strain and nitrogen interactions were significant increase in grain yield was observed in strain USDA 24 M₁ with 30 kg N per ha (25.69 q/ha) over standard strain SB 120 with 30 kg N per ha (24.50 q/ha). Among nitrogen treatments maximum grain yield was recorded in 30 kg N per ha (21.93 q/ha). Nitrogen content in soil after harvest was increased due to inoculation of effective *Bradyrhizobium japonicum* strain (USDA 24 M₁) with 30 kg N per ha (246.33 kg N/ha) over the other strains and uninoculated control.

AGRICULTURAL ECONOMICS

Production and Marketing of Eri Silk Cocoon in North Eastern Region of India- An Economic Analysis

RAJIB DEB

2001

MAJOR ADVISOR : Dr.S.M. MUNDINAMANI

An attempt was made in the present study to analyse the economics of castor cultivation and eri-silk, cocoon production in Barpeta district of Assam and Ribhoi district of Meghalaya. Primary data required for study was elicited from 90 ericulturist 45 each from Barpeta and Ribhoi districts, respectively, during, 1999-2000. Tabular analysis was used to compute costs and returns in castor cultivation and eri silk cocoon production. Production function analysis was carried out to assess the resource use efficiency in castor cultivation and eri-silk cocoon production. The results of the study revealed that per hectare cost of castor cultivation was Rs.8454.68. The gross and net returns realized from castor cultivation were Rs.9652.85 and Rs.1198.17, respectively. The returns per rupee invested were Rs. 1.14.

The resource use efficiency revealed that the labour factor was significantly over utilized where as other factor did not effect the output significantly in both castor cultivation and eri-silk cocoon production.

The total cost of eri-silk cocoon production was Rs.12879.91 per annum per hectare. The operational cost accounted for over 97 per cent. On an average, annually,

65.72 kg of cut cocoons was obtained by rearing 642.5 layings in one hectare of castor cultivation. The gross and net returns realized from eri-silk cut cocoons were Rs.17615.09 and Rs. 473 5. 19, respectively.

Two channels were identified in marketing, of eri-silk. Cut cocoons.channel-1 involving middlemen handled more than 70 per cent of the produce whereas government directly involved in procurement of cocoons from the farmers. The price spread was 73.56 per cent for channel-I and 99.48 per cent for channel-II. The trader's share was 46.1 per cent and the rearer share was 53.29 per cent shared the cost of marketing.

The major problem encountered by the ericulturist in castor cultivation was attack of pests and diseases and non-availability of timely technical services. In eri-silk cocoon production also the attack of pest and diseases followed by non-availability of credit facility was the major problem. Problem associated with marketing was involving of middlemen.

For higher profits the farmer should cut down labor use to optimum level and should follow regular package and practices.

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Production and Export of Turmeric in South India An Economic Analysis

S. ANGLES

2001

MAJOR ADVISOR : Dr.S.B.HOSAMANI

The growth and instability of turmeric were examined in terms of area, production and productivity in important states of south India. The price trend of turmeric in important markets of south India, also the export performance and direction of trade of turmeric were analysed. The secondary data was used for the study. The exponential growth function, decomposition analysis, correlation and regression techniques and Markov chain analyses were used.

The results revealed that all the states registered significant growth in area, production and productivity, except in the case of area in Tamil Nadu and Kerala, production in Tamil Nadu and productivity in Karnataka. There was a high instability in production of turmeric in Andhra Pradesh and Tamil Nadu, moderately in Karnataka and there was high stability in Kerala. The introduction of improved technologies and high yielding varieties etc. Were the important reasons.

In the case of wholesale prices, there was an increasing trend in all the markets, which was the highest in duggirala followed by cochin markets. The price integration showed that almost all markets were highly integrated.

The growth in export of turmeric were significant in total quantity, total value and unit value of turmeric, because of the high demand coupled with inflation. The results of Markov chain analysis showed that previous export share retention for Indian turmeric was high in UK (42.99 per cent) and countries pooled under the others category (58.77per cent). The countries such as USA, Iran, Japan and UAE were not stable importers of Indian turmeric.

Based on the findings of the present study it could be concluded that the productivity of turmeric should be stepped up through appropriate yield raising measures. To attain the stability of turmeric production the variables have to be controlled through appropriate corrective measures. The wholesale prices of turmeric were highly integrated in all the markets but fluctuation was higher. The trends in whole sale prices were increasing in all the markets, so for preventing the fluctuations, a nation wide web has to be created. Appropriate export promotion strategies have to be evolved to diversify the geographical concentration. These promotion strategies were essential to maintain our monopoly position in the world.

Lift Irrigation in Krishna River Belt-An Economic Analysis

A.S. VASANTHA KUMAR

2001

MAJOR ADVISOR: Dr. B.L. PATIL

The study was undertaken in Athani, Raibagh and Chikkodi taluks of Belgaum district of Karnataka. Data were collected from 72 adopters and 48 non-adopters of lift irrigation system. Tabular, financial feasibility and sensitivity analysis and logit models were employed to analyse the data. The total investment on lift irrigation structure amounted to Rs. 1.08 lakh per respondent. The cost on plastic pipes accounted for 26.82 per cent of the total investment. Costs incurred on lift irrigation system in Belgaum district indicated the major costs incurred on repairs of the system (Rs.4616.41) accounting for 3.75 per cent. The net additional return over non-adopters was Rs. 653 86.43 per farm.

At 12 per cent of discount rate, the NPV of the investment was Rs.349414.76, the BC ratio, the IRR and pay back period were 1.51, 78 per cent and 3.01 years respectively. The investment in the lift irrigation project were found financially feasible. With the help of maximum likelihood estimates of the logit model for a farmer's decision to adopt lift irrigation system which helps in identifying the

socio-economic factors responsible for adoption and non-adoption of lift irrigation system land holding (LAND) with co-efficient 0.2680 was observed as one of the important factor which influenced positively at 1 per cent level of significance on the adoption of lift irrigation system. Where as the factors like distance of field from the river (DFR) indicated the co-efficient was -0.0006 had negative level of significance at 1 per cent level. Power cut/power supply, drainage and motor burning due to voltage fluctuation were the few severe constraints faced by adopted farmers indicating 87 per cent, 80 per cent and 77 per cent respectively. The policy implications of the study are, to encourage the small and medium farmers, higher amount of credit on the security of land holding needs to be extended at a lower rate of interest with a reduced procedural bottlenecks and the state government should take steps to supply power at least during seasons. And the large sized land holding respondents who were far away from the river basin could think of community lift irrigation schemes through Co-operatives.

Production and Export Performance of Selected Spices in South India an Economic Analysis

T. JAYESH

2001

MAJOR ADVISOR : Dr. L.B. HUGAR

The growth in area, production and productivity and the financial feasibility of cultivation of pepper and cardamom small in the south Indian states were examined. The price integration of these spices in the selected markets, their export performance, competitiveness and trade directions were also analysed. Secondary data for the period from 1982-83 to 1998-99 was made use of for the study. The exponential growth function, project analysis techniques, correlation, nominal protection co-efficient and markov chain analyses were used.

The results revealed that all the states recorded a significant growth in area and production of pepper. However, productivity recorded a negative growth rate in case of Karnataka (-0.473) and Tamil Nadu (-1.622), mainly due the prevalence of age-old plantations and heavy incidence of quick wilt. In case of cardamom, all the states recorded a negative growth in area, mainly due to the ecological degradation of cardamom growing tracts. However, the productivity and production has shown a significant increase.

The cultivation of these spices was found to be financially feasible and also there was a strong integration among their selected markets.

A positive growth was found in the export quantity, value and unit value of pepper, mainly because of the increasing trend in global demand. But a negative growth was recorded in the case of export quantity of cardamom due to severe competition from Guatemala coupled with an increase in internal demand. The nominal protection coefficient indicated that Indian pepper is competitive in the international market. The markov chain analysis revealed that Russia and USA were the major importers of Indian pepper mainly due to their preference for the high quality Indian pepper. In case of cardamom, only Japan was found to be the stable importer and will continue to be so for the next one decade.

Based on the findings of the study it could be concluded that, there is an urgent need for enhancing the productivity level of both pepper and cardamom in order to meet the rising internal as well as global demand and also to make their cultivation financially more sound. Appropriate export promotion strategies have to be evolved to diversify the geographical concentration of our exports. Especially, in case of cardamom exports a major thrust should be given to increase our exports to the Middle East countries, since this region is the major consumer of cardamom in the world.

AGRICULTURAL BUSINESS MANAGEMENT

Grading, Processing and Marketing of Cashewnuts In North District of Goa

AMITA NAMDEO NAIK

2001

MAJOR ADVISOR : Dr. L.K. WADER

Cashew was introduced to India by the Portuguese about 400 years ago. It plays an important role in the Indian economy as it act as foreign exchange earner. The quality of agricultural produce brought to the market by the farmers varies from lot to lot. So it is highly essential to grade the produce on scientific lines, in order to get remunerative prices. So the present study was undertaken to develop grade standard, study quality price relationship, procurement, processing and marketing management of cashew processing units in North District of Goa. Out of 42 units in North District of Goa, 15 units were selected randomly. The primary data was collected through personal interview for the year 1999-2000. Laboratory analysis, indexing, stepwise multiple regression analysis and tabular presentation were employed for data analysis.

Five grade standards were developed for cashewnut based on composite index. The results based on price quality relation brought out that number of nuts, moisture percentage and cutting test reduced the prices and these factors explained 95 per cent variation. In present study only two pattern of procurement of cashewnut were followed. The procurement was maximum in the month of May followed by April. The total cost of carrying inventory was higher for large units (Rs. 526.92 per quintal) than small and medium size units. The total cost of cashew kernel production in cashew processing units was Rs. 4063.22 per quintal. While net returns was Rs. 125.78 per quintal. On an average maximum quantity of cashew kernels were marketed through distributor and the cost of marketing was high in the same (Rs. 98.36/tin). The major problems faced by the processors were non-availability of raw nuts, improper grading of raw nuts and high working capital.

AGRICULTURAL EXTENSION EDUCATION

Case Studies on Organic Farming

K. S. THIMMAREDDY

2001

MAJOR ADVISOR: Dr. B. SUNDARASWAMY

The case studies conducted on organic farming involving ten farmers who are pursuing organic farming over more than five years in different parts of Karnataka revealed the following results.

As to the understanding of the meaning of organic farming forty per cent of the respondents perceived organic farming as non use of chemical of any type in production and another 40 per cent opined organic farming as use of locally available eco-friendly materials in farm production.

Organic farming increases soil fertility and also microbial activity in the soil was the special feature of organic farming as understood by 70 per cent of the respondents. Majority of the respondents (60%) were motivated by other farmers who were practicing organic farming to go for organic farming.

Majority (70%) of the respondents opined that health hazards are more in chemical farming. Sixty per cent quoted high cost of cultivation and also deterioration of soil properties in chemical farming and these factors led them to take up organic farming.

Forty per cent of the respondents used sugarcane trash for mulching in sugarcane. Ninety per cent of the respondents were using farmyard manure, followed by vermicompost (50%), aurogreen manure (50%), compost (30%), sheep penning (20%), poultry manure (10%) and dung chocolate (10%).

All the respondents were used leaf extracts, cow urine, NSKE, vermiliquid and buttermilk for the control of pest and diseases in crop plants.

Forty per cent of the respondents opined that there was decrease in returns in the initial period i.e. 3 to 4 years of organic farming.

Majority of the respondents (70%) faced marketing problem of organically grown produce. Half of the respondents (50%) benefited from organic farming because of their crops become tolerant to moisture stress and less prone to pest and diseases. Soils became fertile for 50 per cent of the respondents.

A Study on Knowledge and Adoption of Sustainable Cultivation Practices in Sugarcane and Cotton by Farmers in Cuddalore District of Tamil Nadu

K.SOPHIA SATHYAVATHY

2001

MAJOR ADVISOR : Dr. D.M.CHANDARGI

The study was conducted during 2000-2001 in Cuddalore district of Tamil Nadu. Eighty sugarcane and cotton farmers each from 4 villages of two taluks formed the sample and personal interview method was followed to collect the data. The major findings of the study were: majority of the sugarcane and cotton farmers had medium knowledge regarding the sustainable cultivation practices. Regarding the practicewise knowledge, cent per cent of the sugarcane farmers had correct knowledge about crop rotation, intercropping, trashing, trash mulching, collection and destruction of diseased plant parts. Majority of the farmers had correct knowledge about application of FYM (85.00%), use of bio-agents (96.25%), use of botanical pesticides (85.00%), sett treatment with *Azospirillum* (76.25%) and use of green manures (58.75%). Cent per cent of cotton farmers had correct knowledge about hand weeding, collection and destruction of pests. Majority of the farmers had correct knowledge about intercropping (90.00%), collection and destruction of diseased parts

(78.75%), trap cropping (77.50%), botanical pesticides (70.00%) and organic manure application (67.50%). Regarding adoption, cent per cent of sugarcane farmers adopted trashing and trash mulching. Crop rotation with paddy, intercropping with groundnut and bio-agents were adopted by 97.50, 83.75 and 91.25 per cent, respectively. Organic manures were adopted by 66.25 per cent of the farmers. Regarding the cotton farmers, cent per cent of them adopted hand weeding. Majority of the farmers adopted hand picking and destruction of pests (81.25%), intercropping with blackgram (70.00%), goat penning (51.25%) and trap cropping with bhendi (68.75%). The socio-economic status of sugarcane farmers was better compared to cotton farmers. The problems elicited from the farmers in adopting the sustainable cultivation practices were labour demand, higher labour cost, lack of knowledge, inadequacy of input, lack of time and non-availability of inputs in time.